URANGA PHYSICS EXAMINATION

Kenya Certificate of Secondary Education

232 FORM 1 PHYSICS

(Theory)

4TH EDITION (DEC. 2021, TERM 2) – TIME 2 Hours

MARKING SCHEME

SECTION A (25 MARKS)

(Answer all the questions in this section)

1. State what thermodynamics as a branch of Physics deals with. **(1 mark)**

- *It deals with the **transformation of heat to and from other forms of energy**✓1 and the accompanying changes in pressure, volume etc.* ***1mk***

2. Explain the **first aid measure** for electric shock as a form of injury in a Physics laboratory. **(1 mark)**

- *Put off the main switch first before treating the shock✓1* ***1mk***

3. A form one girl at Agoro Oyombe Secondary School did an experiment using a stop watch to measure the duration for **20 swings** of a simple pendulum and got the result indicated in **figure 1** below.

Fig. 1

Record the indicated time in **SI units**. **(1 mark)**

= 18s + 0.74 s = 18.74s ✓1 ***1mk***

4.

a) Name **two** main factors that should be put into consideration when choosing a measuring instrument for a given task. **(2 marks)**

- *Degree of accuracy required. ✓1*

- *Type/shape of length e.g. circular or straight ✓1*
- *Size of length ✓1* ***any two 2mks***

b) A student measured the length of a wire **four** times using a meter rule and obtained the following readings: **18.6cm; 18.5cm; 18.6cm**; and **18.5cm**. Determine the average length the student should record. **(2 marks)**

Average length $= \frac{18.6+18.5+18.6+18.5}{4}$ *✓1*

= 18.55 cm ✓1 (must show the work) ***2mks***

5.Convert **204000 cm^3** into **SI** units. **(1 mark)**

= 204000 × 10^{-6} = 0.204m^3 ✓1(must show the work) ***1mk***

6. Name any **two** effects of force. **(2 marks)**

- *Force can make stationary object move. ✓1*
- *It can increase speed of moving object. ✓1*
- *It can stop a moving object. ✓1*
- *It can decrease/slow down the speed of moving object. ✓1*
- *It can change shape of an object (i.e. can deform/distort an object). ✓1*
- *It can make an object turn about a fixed point (pivot)/ turning effect of force. ✓1*
- *It can change the direction of a moving object. ✓1* ***any two 2mks***

7. Name the type of force that**:** **(2 marks)**

(i) Opposes motion between two surfaces in contact.

- *Friction force ✓½*

(ii) Makes an object appear lighter when being lifted out of water.

- *Up thrust force ✓½*

(iii) Attracts pieces of papers to a plastic ruler when the ruler is rubbed on hair.

- *Electrostatic force ✓½*

(iv) Enables a body to move in a circular motion.

- *Centripetal force ✓½*

Total 2mks

8.

a) State **two** factors that affect the surface tension force on a water surface. **(2 marks)**

- *Presence of impurities ✓1 e.g. soap detergents, kerosene etc*
- *Temperature ✓1* ***2mks***

b) **Figure 2** shows a toy boat. A piece of soap is attached to end **A** and then the toy placed on a surface of clean water.

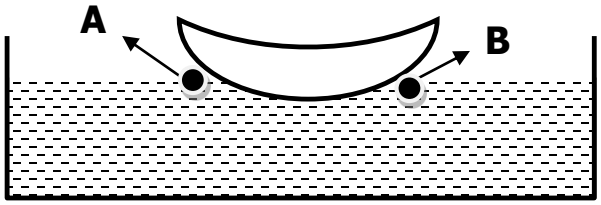


Fig. 2

Immediately, it is observed that the toy boat moves towards point B. Explain this observation. (**2 marks)**

- *soap **breaks /lowers/weakens**✓ surface tension ✓1at **A.***
- ***higher/greater** surface tension at point B pulls toy boat. ✓1* ***2mks***

9. **Figure 3** shows the meniscus of water as it rises in a glass tube.

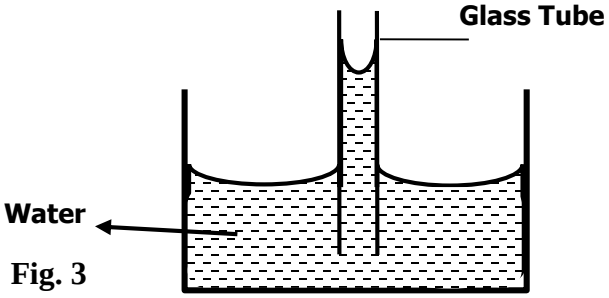


Fig. 3

Explain why meniscus of water is shaped as shown above. **(2 marks)**

*There is **stronger** adhesive force between **water and glass molecules**✓1 and **weaker** cohesive forces between **water molecules.** ✓1 (award zero if no mention of molecules or particles)* ***2mks***

10.

a) Define pressure and state its SI units **(2 marks)**

- *force acting perpendicularly/normally per unit area ✓1*
- *SI unit is **the newton per square meter (N/m^2) or the pascal (Pa).** ✓1* ***2mks***

b) A man of weight 840N stands upright on a floor. If the area of contact of his shoes and floor is 420cm^2, determine the average pressure he exerts on the floor. **(3 marks)**

$P = \frac{F}{A}$ ✓1 *formula*

$= \frac{840N}{(420\times10^{-4})m^2}$ ✓1 *correct substitution (award double marks if no formula stated)*

= 20, 000 N/m^2(or 20, 000 Pa) ✓1 evaluation with correct units ***3mks***

11. Explain the following:

a. why a trailer carrying heavy loads have many wheels? **(1 mark)**

- *Many wheels* ***increase the area of contact with the ground thereby reducing pressure***✓*1 exerted on the road. This prevents damage of the roads by tracks.* ***1mk***

b. why water dams are built with thicker walls at the bottom than at the top? **(1 mark)**

- *Thicker walls at the bottom of the dam* ***withstand higher pressure due to increased water column at the bottom***✓1 *than at the top.* ***1mk***

SECTION B (55 MARKS)

12.

a)

(i) What is the meaning of a derived physical quantity? **(1 mark)**

- *a quantity obtained by multiplication or division of other physical quantities*✓1

(ii) State **two** examples of fundamental physical quantities. **(2 marks)**

- *Length, mass, time, temperature (thermodynamic temperature), electric current, amount of substance, and luminous intensity*✓1✓1 ***any two 2mks***

b) You are provided with the following: eureka can, measuring cylinder, water, a string and a stone. Briefly describe how you would determine the volume of an irregular piece of stone. **(4 marks)**

- *Fill Eureka can with water until it overflows.* ✓1
- *Once the water ceases/stops coming out of the spout, place a measuring cylinder under the spout.* ✓1
- *Tie the stone with a thread and lower it gently into water until it is fully submerged*✓1
- *The volume of water collected in the measuring cylinder is the volume of the stone*✓1

c) Give a reason why displacement method is unsuitable for determining the volume of solids such as charcoal. **(1 mark)**

- *it floats in liquid*✓*1*
- *it absorbs liquid*✓*1* ***any one 1mk***

d) **Figure 4** shows a section of a measuring instrument.

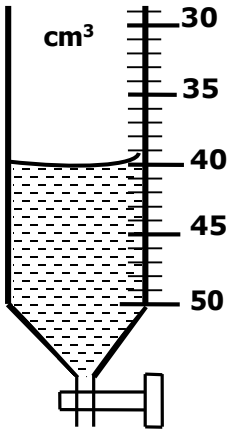


Fig. 4

(i) Name the measuring instrument shown above. **(1 mark)**

Burette ✓1

(ii) What is the volume of water in it? **(1 mark)**

40.0 cm^3✓1

(iii) Some **24** drops of water each of volume **0.5cm^3** are **added** into the instrument above. Find the final reading of the instrument. **(2 marks)**

Volume of 24 drops of water $= 24 \times 0.5 = 12.0 cm^3$ *✓1*

Final reading = 40.0 – 12.0 = 28.0 cm^3 ✓1 **2mks**

13.

a) In finding the density of a liquid, why is the method of using a density bottle more accurate than the one of using a measuring cylinder? **(1 mark)**

- *It measures the exact volume of liquid✓1* ***1mk***

b) In an experiment to determine the density of **liquid L** using a density bottle, the following measurements were recorded:

Mass of empty density bottle = 25.5 g

Volume of the density bottle = 40.0 cm^3

Mass of density bottle full of **liquid L** = 55.5g

Use the above data to determine the:

(i) Mass of **liquid L**. **(1 mark)**

55.5 - 25.5 =30.0g✓1(must show the work) ***1mk***

(ii) Volume of the **liquid L**. **(1 mark)**

40.0 cm^3 ✓1 ***1mk***

(iii) Density of **liquid L**. **(2 marks)**

$\rho = \frac{mass\ of\ liquid\ L}{volume\ of\ liquid\ L}$

$= \frac{30.0g}{40.0cm^3}$ ✓*1correct substitution*

= 0.75g/cm³ (or 750kg/m³) ✓1 evaluation with correct units ***2mks***

c) An alloy is made by mixing **80cm³** of copper of density **9g/cm³** with **120cm³** of alluminium of density **3g/cm³**. Determine the

I. Total mass of the alloy **(2 marks)**

$Mass\ of\ copper\ = \mathbf{9g/cm^3} \times \mathbf{80cm^3} = \mathbf{720g}$
$Mass\ of\ aluminium\ = \mathbf{3g/cm^3} \times \mathbf{120cm^3} = \mathbf{360g}$ } ✓1 *for the two masses*

$total\ mass = 720 + 360 = 1080g$ ✓1 ***2mks***

II. Density of the alloy in **SI** units. **(2 marks)**

Density of the alloy $= \frac{total\ mass\ of\ alloy}{total\ volume\ of\ alloy}$

$= \frac{1080g}{(80+120)cm^3}$ ✓*1*=$\frac{1080g}{200cm^3}$ *correct substitution*

= 5.4g/cm³

= 5400kg/m³ ✓1 evaluation in SI units (award correct evaluation if SI unit not indicated) ***2mks***

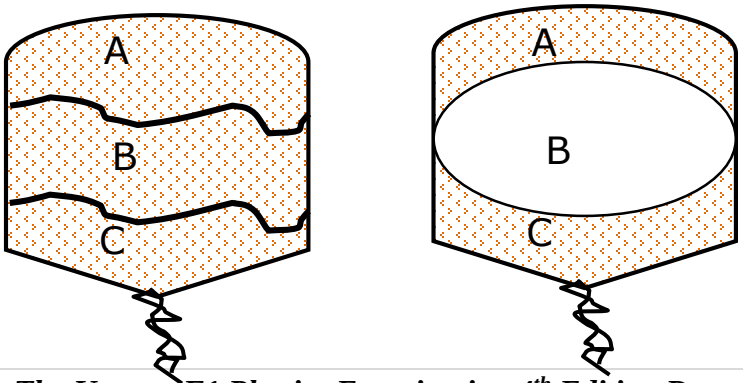
14.

a)

i. Name **two** types of forces which can act between objects without contact. **(2 marks)**

- *Magnetic force* ✓1
- *Electrostatic force* ✓1
- *Force of gravity* ✓1 ***any two 2mks***

ii. **Figure 5** shows a wire loop with two threads tied across it. The loop is dipped into a soap solution such that the soap film covers it as shown.



✓1 *correct shape of threads*

Fig. 5

Region **B** is punctured such that the soap film in that section is broken. On the space alongside the diagram sketch the resulting shape of the wire loop. **(1 mark)**

✓1 *correct shape of threads* ***1mk***

b)

i. Give **three** differences between mass and weight. **(3 marks)**

Mass	***Weight***
The quantity of matter in an object body	*Gravitational pull on an object* ✓1
The SI unit kg (kilogram)	*SI unit is the newton* ✓1
Constant everywhere	*Varies from place to place* ✓1
A scalar quantity	*A vector quantity* ✓1
Measured using a beam balance	*Measured using a spring balance* ✓1

any three 3mks

ii. A student was heard saying "the mass of a ball on the moon is one sixth its mass on earth". Give a reason why this statement is wrong. **(2 marks)**

- *Mass* ***does not change*** ✓1 *since the* ***quantity of matter in a body/ball remains the same*** *everywhere* ✓1

iii. A man has a mass of 60kg. Calculate his weight on earth, where the gravitational field strength is 10N/kg. **(3 marks)**

W = mg ✓1 *formula*

= 60kg × 10N/kg ✓1 *substitution (award double marks if no formula stated)*

= 600N ✓1 *evaluation with correct units* ***3mks***

c) Give **two** examples of vector quantities. **(2 marks)**

- *Weight/Force* ✓1
- *Momentum* ✓1
- *Velocity* ✓1
- *Acceleration* ✓1
- *Displacement* ✓1

any two 2mks

15.

a) Define atmospheric pressure. **(2 marks)**

- *This is the pressure exerted on the earth's surface by the weight of the column of air around it.* ✓✓2 ***1mk***

b) A block of wood plank in the form of a rectangular block measures 10cm by 40cm by 90cm. The solid has a mass of 1800 grams. Calculate:

(i) the density of the solid in kg/m^3. **(3 marks)**

$\rho = \frac{m}{V}$ ✓1 *formula*

$\frac{1.8kg}{(0.1\times0.4\times0.9)m^3}$ ✓1 *correct substitution (award double marks if no formula stated)*

$= 50kg/m^3$ ✓1 *evaluation* ***3mks***

(ii) the weight of the plank. **(take g = 10N/kg)** **(2 marks)**

W =mg

= 1.8kg × 10N/kg ✓1 *substitution*

= 18N ✓1 *evaluation with correct units* ***2mks***

(iii) the minimum pressure it can exert. **(3 marks)**

$Minimum\ pressure = \frac{Weight, W}{Maximum\ area}$ ✓1 *formula*

$= \frac{18N}{(0.4\times0.9\ )m^2}$ ✓1 *correct substitution (award double marks if no formula stated)*

$= \frac{18N}{0.36m^2} = 50\ N/m^2$ ✓1 *evaluation with units* ***3mks***

16.

a)

i. Name **two** factors that affect pressure in fluids. (**2 marks)**

- *Height/depth of fluid column* ✓1
- *Density of fluid* ✓1
- *Gravitational field strength/gravitational acceleration* ✓1 ***any two 2mks***

ii. The reading of mercury barometer is at **70.0cm**. What is the pressure at the place in N/m^2? {take the density of mercury as **13600 kg/m^3**} **(3 marks)**

P = hρg ✓1 *formula*

$= 0.70\ \times 13600 \times 10$ ✓1 *correct substitution (award double marks if no formula stated)*

= 95 200 N/m^2 ✓1 *evaluation* ***3mks***

b)

(i) State the Pascal's principle. **(1 mark)**

pressure applied at one part in a fluid is ***transmitted equally to all other parts*** *of the enclosed liquid* ✓1

1mk

(ii) In a hydraulic press, the surface areas of the pistons are 0.0006 m^2 and 0.0002 m^2 respectively. If a force of 30N is applied downwards on the smaller piston, with what force does the larger piston move upwards? **(3 marks)**

$\frac{F_s}{A_s} = \frac{F_L}{A_L}$ ✓1 *formula*

$\frac{30\ N}{0.0002\ m^2} = \frac{F_L}{0.0006\ m^2}$ ✓1 *correct substitution (award double marks if no formula stated)*

$F_L = \frac{30\ N \times 0.0006\ m^2}{0.0002\ m^2} = 90\ N$ ✓1 *evaluation with units* ***3mks***

State **two** properties of the liquid used as hydraulic brake fluid. **(2 marks)**

(a) *It should not corrode parts of the brake system* ✓1

(b) *It should be highly incompressible* ✓1

(c) *It should have a low freezing point and high boiling point.* ✓1 ***any two 2mks***

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